Memory

Memory refers to retaining and recalling information over a period of time, depending upon the nature of cognitive task you are required to perform.

Memory is conceptualised as a process consisting of three independent, though interrelated stages. These are **encoding, storage, and retrieval**. Any information received by us necessarily goes through these stages.

Encoding is the first stage which refers to a process by which information is recorded and registered for the first time so that it becomes usable by our memory system. Whenever an external stimulus impinges on our sensory organs, it generates neural impulses. These are received in different areas of our brain for further processing. In encoding, incoming information is received and some meaning is derived. It is then represented in a way so that it can be processed further.

Storage is the second stage of memory. Information which was encoded must also be stored so that it can be put to use later. Storage, therefore, refers to the process through which information is retained and held over a period of time.

Retrieval is the third stage of memory. Information can be used only when one is able to recover it from her/his memory. Retrieval refers to bringing the stored information to her/his awareness so that it can be used for performing various cognitive tasks such as problem solving or decision-making. It may be interesting to note that memory failure can occur at any of these stages. You may fail to recall an information because you did not encode it properly, or the storage was weak so you could not access or retrieve it when required.

Information Processing Approach –

The stage model (Atkinson and Shiffrin, 1968)

This was the first model of memory which proposed that memory consisted of three stores- **a sensory register, short-term memory (STM) and long-term memory (LTM).**

Each of these systems have different features and perform different functions with respect to the sensory inputs

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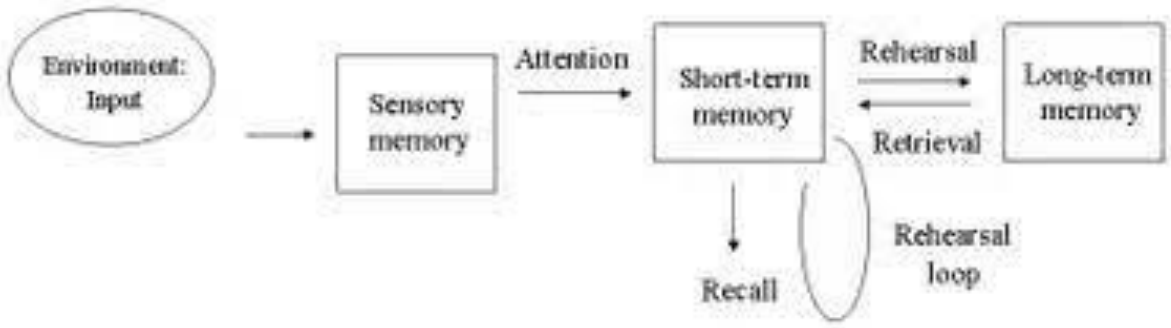


Sensory Memory

The incoming information first enters the sensory memory. Sensory memory has a large capacity. However, it is of very short duration, i.e., less than a second. It is a memory system that registers information from each of the senses with reasonable accuracy. Often this system is referred to as sensory memories or sensory registers because information from all the senses is registered here as exact replica of the stimulus. Information that is attended to enters the second memory store called the short-term memory.

Short Term Memory holds small amount of information for a brief period of time (usually for **30 seconds** or less). Atkinson and Shiffrin propose that information in STM is primarily encoded **acoustically**, i.e., in terms of sound and unless rehearsed continuously, it may get lost from the STM in less than 30 seconds. Note that the STM is fragile but not as fragile as sensory registers where the information decays automatically in less than a second.

Long-term Memory

Materials that survive the capacity and duration limitations of the STM finally enter the long-term memory (LTM) which has a vast capacity. It is a permanent storehouse of all information that may be as recent as what you ate for breakfast yesterday to as distant as how you celebrated your sixth birthday. It has been shown that once any information enters the long-term memory store it is never forgotten because it gets encoded semantically, i.e., in terms of the meaning that any information carries.

Atkinson and Shiffrin propose the notion of **control processes** which function to monitor the flow of information through various memory stores.

Only that information which is attended to enters the STM from sensory registers and in that sense, selective attention, is the first control process that decides what will travel from sensory registers to STM. Sense impressions, which do not receive attention, fade away quickly. The STM then sets into motion another control process of **maintenance rehearsal** to retain the information for as much

time as required. These kinds of rehearsals simply maintain information through **repetition** and when such repetitions discontinue the information is lost. Another control process, which operates in STM to expand its capacity, is **Chunking.** Through chunking it is possible to expand the capacity of STM which is otherwise 7+2.

From the STM, information enters the long-term memory through **elaborative rehearsals**. As against maintenance rehearsals, which are carried through silent or vocal repetition, this rehearsal attempts to connect the 'to be retained information' to the already existing information in long-term memory.

In elaborative rehearsals one attempts to analyse the information in terms of various associations it arouses.

Level of Processing Approach

The levels of processing view were proposed by Craik and Lockhart in 1972. This view suggests that the processing of any new information relates to the manner in which it is **perceived, analysed, and understood** which in turn determines the extent to which it will eventually be retained.

Craik and Lockhart proposed that it is possible to analyse the incoming information at more than one level. One may analyse it in terms of its **physical or structural features.**

For example, one might attend only to the shape of letters in a word say cat - in spite of whether the word is written in capital or small letters or the colour of the ink in which it is written. This is the first and **the shallowest level of processing**. At an intermediate level one might consider and attend to the **phonetic sounds** that are attached to the letters and therefore the structural features are transformed into at least one meaningful word say, a word cat that has three specific letters. Analysing information at these two levels produces memory that is fragile and is likely to decay rather quickly.

However, there is a third and the **deepest level** at which information can be processed. In order to ensure that the information is retained for a longer period, it is important that it gets **analysed and understood in terms of its meaning**. For instance, you may think of cat as an animal that has furs, has four legs, a tail, and is a mammal. You can also invoke an image of a cat and connect that image with your experiences.

To sum up, analysing information in terms of its structural and phonetic features amounts to shallower processing while encoding it in terms of the meaning it

carries (the semantic encoding) is the deepest processing level that leads to memory that resists forgetting considerably.

Tulving Memory Model

Tulving researched memory with a speciality in episodic memory (the kind of memory that allows us to "mentally travel" in time and thus recollect own past experiences, events we have observed and participated in). One of his main contributions to his theory is of "Encoding-Specifity". The theory emphasizes the fact that memories are retrieved from LTM by means of retrieval cues. The theory of encoding specifity states that the most effective retrieval cues are those that were stored along with the memory of the experience itself.

Episodic memory

Episodic memory contains biographical details of our lives. Memories relating to our personal life experiences constitute the episodic memory and it is for this reason that its contents are generally emotional in nature.

Distinguishing features of episodic memory- **Autonoetic consciousness**, **noetic, anoetic and Chronesthesia"**

Tulving suggested that there is correspondence between three different types of consciousness and three different memory system.

Autonoetic (self-knowing) corresponds to a form of consciousness that is most like episodic memory.

Noetic consciousness corresponds to semantic memory.

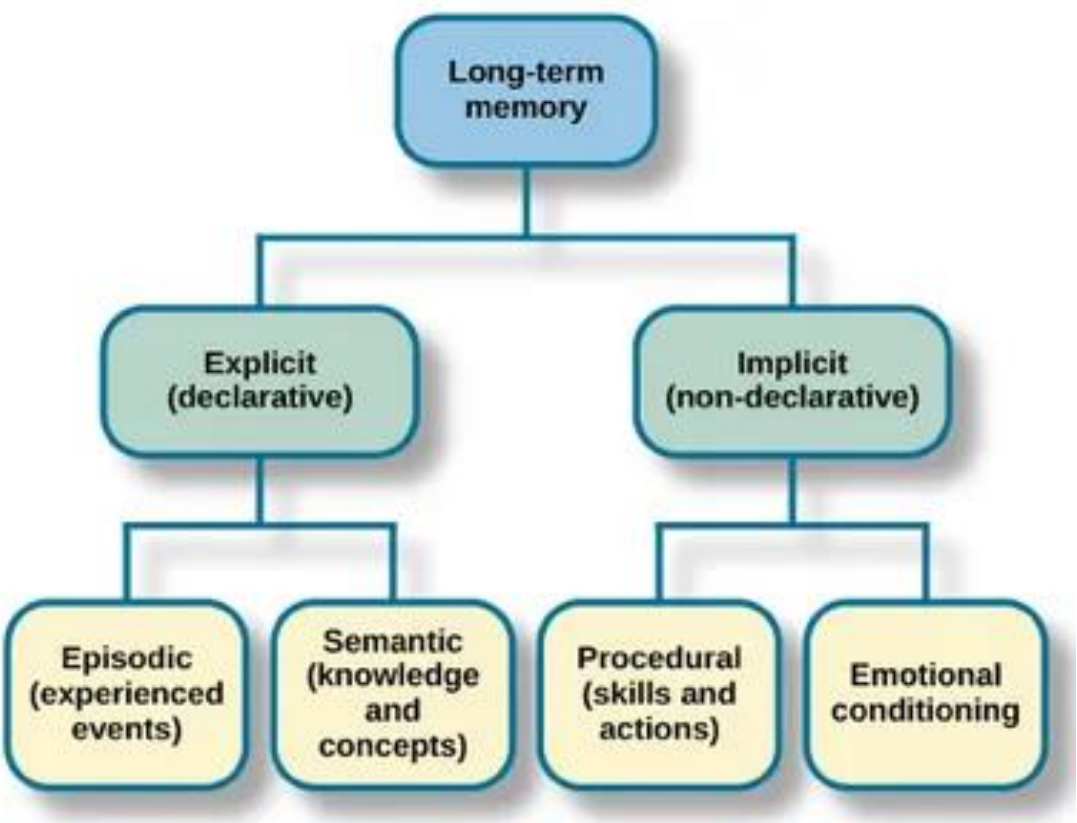
Anoetic consciousness corresponds to procedural memory.

Chronesthesia - is the subjective sense of time, which is also critical for locating memories in the personal past and re-experiencing them as a part of the past. The awareness of past, present and future is chromesthesia.

Chronesthesia emphasizes the awareness of subjective time, autonoetic consciousness emphasize the specific role of the experience of self in subjective time.

Semantic memory

Semantic memory, on the other hand, is the memory of general awareness and knowledge. All concepts, ideas and rules of logic are stored in semantic memory. For instance, it is because of semantic memory that we remember the meaning of say 'nonviolence' or remember that 2+6=8. Unlike episodic memory this kind of memory is not dated; you perhaps will not be able to tell when you learnt the meaning of non-violence or on which date you came to know that Bangalore is the capital of Karnataka. Since the contents of semantic memory relate to facts and ideas of general awareness and knowledge, it is **affect-neutral** and not susceptible to forgetting.



Procedural Memory

Procedural memory is a type of long-term implicit memory that involves the performance of certain cognitive and motor tasks without the conscious retrieval of past information (Lum, Conti-Ramsden, Page & Ullman, 2011). It is the memory for skilled actions, such as how to brush your teeth, how to drive a car, how to swim the crawl (freestyle) stroke.

Procedural memories are inadvertently retrieved and unconsciously used for the performance of various motor skills and cognitive tasks.

Long Term Memory Classification

Flashbulb Memory

These are memories of events that are very arousing or surprising. Such memories are very detailed. They are like a photo taken with an advanced model camera. You can push the button, and after one minute you have a recreation of the scene. You can look at the photograph whenever you want. Flashbulb memories are like images frozen in memory and tied to particular places, dates, and times. Perhaps, people put in greater effort in the formation of these memories, and highlighting details might lead to deeper levels of processing as well as offer more cues for retrieval

Autobiographical Memory

These are personal memories. They are not distributed evenly throughout our lives. Some periods in our lives produce more memories than others. For instance, no memories are reported pertaining to early childhood particularly during the first 4 to 5 years. This is called **childhood amnesia**. There is a dramatic increase in the frequency of memories just after early adulthood, i.e., in the twenties. Perhaps emotionality, novelty, and importance of events contribute to it. During old age, the most recent years of life are likely to be well remembered. However, before this, around 30 years of age, decline in certain kinds of memory starts.

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